	Application No.	Applicant(s)
	10/608,391	YAMAGAMI, KENJI
Notice of Allowability	Examiner	Art Unit	
	Hetul Patel	2186	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *06/14/2006*.

2. ☒ The allowed claim(s) is/are *48-49, 51-52, 54-57, 59-61 and 75; renumbered as 1-12, respectively*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some*   c) ☐ None of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of
        Paper No./Mail Date _____ .

    Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date *03/20/06;05/08/06*

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

DETAILED ACTION

1.   This action is responsive to the Supplemental Amendment filed on June 14,

2006. This amendment has been entered and carefully considered.   Claims 1-20 are

again presented for examination.

2.   The information disclosure statements (IDS) submitted on 03/20/2006 and

05/08/2006 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the

information disclosure statements are being considered by the examiner.

3.   Claims 48-49, 51-52, 54-57, 59-61 and 75 are allowed and renumbered as 1-12,

respectively.

EXAMINER'S AMENDMENT

4.   An examiner's amendment to the record appears below. Should the changes

and/or additions be unacceptable to applicant, an amendment may be filed as provided

by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be

submitted no later than the payment of the issue fee.

5.   Authorization for this examiner's amendment was given in a telephone interview

with Srinath Malur (Reg. No. 34,663) on 06/21/2006.

6.   The application has been amended as follows:

CLAIMS 1-47 (Canceled).

CLAIM 48 (Currently Amended):

A method for processing data in an application data store comprising:

- producing at least a first snapshot of an application data store, the application data store configured to receive data by way of write operations issued from a host device;

- ~~producing a journal entry for each write operation issued from the host device;~~ storing each~~,~~ journal entry <u>for each write operation issued from the host device</u> in a journal data store, thereby accumulating a list of journal entries;

- monitoring an amount of free space on the journal data store;

- when the <u>amount of</u> free space falls below a first threshold value, then removing one or more journal entries from the journal data store, thereby increasing the <u>amount of</u> free space, wherein enough of the journal entries are removed so that the <u>amount of</u> free space rises above a second threshold value, and

- wherein each journal entry comprises a fixed-size header portion and a variable-size data portion, wherein the journal data store comprises a first storage area within which a plurality of header portions are defined and a second storage area for storing a plurality of data portions, and wherein <u>storing</u>~~producing~~ a journal entry includes allocating one of the journal headers and allocating a sufficient amount of space in the data portion to contain data associated with the write operation.

CLAIM 49 (Previously Presented):

The method of claim 48 wherein removing one or more journal entries includes updating the first snapshot by applying one or more journal entries to the first snapshot, beginning with an oldest journal entry, wherein journal entries applied to the first snapshot are removed from the list of journal entries thereby increasing the <u>amount of</u> free space of the journal data store.

CLAIM 50 (Cancelled).

CLAIM 51 (Previously Presented):

The method of claim 48 wherein removing one or more journal entries includes looking for a most recent snapshot, removing journal entries in the journal data store that are earlier in time than the most recent snapshot.

CLAIM 52 (Previously Presented):

The method of claim 48 wherein the first threshold value and the second threshold value are different.

CLAIM 53 (Cancelled).

CLAIM 54 (Previously Presented):

The method of claim 48 wherein storing each journal entry includes allocating one of the journal headers from the first portion such that the journal headers are always allocated in sequential manner and when the last journal header is allocated then allocating journal headers from the beginning of the first portion in sequential manner.

CLAIM 55 (Currently Amended):

A data processing method comprising:

- producing at least a first snapshot of at least a portion of an application data store, the application data store being configured to receive write operations issued from a host device;

- recording a plurality of journal entries, each journal entry being recorded for a write operation issued from the host device, each journal entry being stored in a journal data store thereby consuming an amount of free space of the journal data store;

- updating the at least first snapshot with at least one journal entry, including associating space consumed by the at least one journal entry with the free space and removing the at least one journal entry when the amount of free space falls below a first threshold value thereby increasing the amount of free space of the journal data store so that the amount of free space rises above a second threshold value,

- associating sequence numbers to the first snapshot and to the journal entries;

- receiving a target time;

- determining a beginning journal entry based on the sequence numbers associated with the journal entries and the sequence number associated with the first snapshot;

- updating the first snapshot by applying the beginning journal entry to it; and

- performing additional updates to the first snapshot by applying journal entries that are subsequent in time to the beginning journal entry and prior in time to the target time.

CLAIM 56 (Currently Amended):

The method of claim 55 wherein the step of updating includes periodically monitoring the amount of free space of the journal data store and if the amount of free space falls below the a first threshold value then updating the at least first snapshot.

CLAIM 57 (Currently Amended):

The method of claim 56 wherein the step of updating the at least first snapshot is repeated for a number of journal entries so that the <u>amount of</u> free space rises above ~~a~~<u>the</u> second threshold value.

CLAIM 58 (Cancelled).

CLAIM 59 (Currently Amended):

A data processing method comprising:

-   producing at least a first snapshot of at least a portion of an application data store, the application data store being configured to receive write operations issued from a host device;

-   recording a plurality of journal entries, each journal entry being recorded for a write operation issued from the host device, each journal entry being stored in a journal data store thereby consuming an amount of free space of the journal data store;

-   updating the at least first snapshot with at least one journal entry,~~including~~ ~~associating space consumed by the at least one journal entry with the free space~~ <u>and</u> <u>removing the at least one journal entry when the amount of free space falls below a</u> <u>first threshold value</u> thereby increasing the <u>amount of</u> free space of the journal data store <u>so that the amount of free space rises above a second threshold value</u>;

-   producing additional snapshots thereby accumulating a plurality of snapshots;

-   associating sequence numbers to the snapshots and to the journal entries;

-   receiving a target time;

-   determining a selected snapshot based on the target time;

-   determining a beginning journal entry based on the sequence numbers associated with the journal entries and the sequence number associated with the selected snapshot;

-   updating the selected snapshot by applying the beginning journal entry to it; and

-   performing additional updates to the selected snapshot by applying journal entries that are subsequent in time to the beginning journal entry and prior in time to the target time.

CLAIM 60 (Previously Presented):

The method of claim 59 wherein the selected snapshot is a first snapshot.

CLAIM 61 (Previously Presented):

The method of claim 59 wherein the selected snapshot is closest in time to the target time and prior in time to the target time.

CLAIMS 62-74 (Canceled).

CLAIM 75 (Currently Amended):

A storage system for processing data comprising:

- a production data store configured to receive write operations from a host device;

- a snapshot data store configured to store one or more snapshots of at least a portion of the production data store;

- a journal data store configured to store one or more journal entries; and

- a controller configured to:

  o access the production data store and the snapshot data store to store one or more snapshots of at least a portion of the production data store on the snapshot data store;

  o access the journal data store to record a journal entry for each write operation from the host device;

  o update one of the snapshots with some, but not all, of the journal entries thereby leaving some journal entries for a data recovery operation <u>and removing at least one journal entry when an amount of free space in the journal data store falls below a first threshold value so that the amount of free space rises above a second threshold value,</u>

- wherein the controller is further configured to:

  o associate sequence numbers to the snapshots and to the journal entries;

  o receive a target time;

  o select a snapshot based on the target time;

  o determine a beginning journal entry based on the sequence numbers associated with the journal entries and the sequence number of the selected snapshot;

  o update the selected snapshot by applying the beginning journal entry to it; and

     o   perform additional updates to the selected snapshot by applying journal entries that are later in time than the beginning journal entry and earlier in time than the target time.

CLAIMS 76-78 (Canceled).

REASONS FOR ALLOWANCE

7.   The following is an examiner's statement of reasons for allowance:

The prior arts of record do not teach nor suggest, either alone or in combination, **all** the limitations of the amended claims of the current invention (claims 48, 55, 59 and 75); particularly a data processing method, as recited in claim 48, having steps of removing the at least one journal entry when the amount of free space falls below a first threshold value thereby increasing the amount of free space of the journal data store so that the amount of free space rises above a second threshold value; and wherein each journal entry comprises a fixed-size header portion and a variable-size data portion, wherein the journal data store comprises a first storage area within which a plurality of header portions are defined and a second storage area for storing a plurality of data portions and producing a journal entry for each write operation issued from the host device by allocating one of the journal headers and allocating a sufficient amount of space in the data portion to contain data associated with the write operation; and

a data processing method and system, as recited in claims 55, 59 and 75, comprising steps of updating the at least first snapshot with at least one journal entry and removing the at least one journal entry when the amount of free space falls below a first threshold value thereby increasing the amount of free space of the journal data

store so that the amount of free space rises above a second threshold value;

associating sequence numbers to the snapshots and to the journal entries; receiving a

target time; determining a selected snapshot based on the target time; determining a

beginning journal entry based on the sequence numbers associated with the journal

entries and the sequence number associated with the selected snapshot; updating the

selected snapshot by applying the beginning journal entry to it; and performing

additional updates to the selected snapshot by applying journal entries that are

subsequent in time to the beginning journal entry and prior in time to the target time.

 Claims 49, 51-52, 54, 56-57 and 60-61 further limit the allowable independent

claims. These claims are therefore allowable for the same reason as set forth supra.

 Any comments considered necessary by applicant must be submitted no later

than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on

Statement of Reasons for Allowance."

8. Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Hetul Patel whose telephone number is 571-272-4184.

The examiner can normally be reached on M-F 8-4:30.

 If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Matt Kim can be reached on 571-272-4182. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MATTHEW KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER